

collection line must be equipped with at least one analyzer to activate the alarms and automatic shutdown systems required by this section.

(f) Each oxygen or hydrocarbon analyzer required by this section must:

(1) Be installed in accordance with API Recommended Practice 550 (incorporated by reference; *see* § 154.106);

(2) Have a response time of not more than 30 seconds from the time the vapor is sampled; and

(3) Sample the vapor concentration continuously not more than 30 pipe diameters from the gas injection point.

(g) Oxygen analyzers which operate at elevated temperatures (*i.e.*, zirconia oxide or thermomagnetic) must not be used.

(h) An inerting system must:

(1) Supply sufficient inert gas to the vapor stream to ensure that the oxygen concentration throughout the vapor collection system is maintained below 8.0 percent by volume;

(2) Activate an alarm when the oxygen concentration in the vapor collection line exceeds 8.0 percent by volume;

(3) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this part when the oxygen concentration in the vapor collection line exceeds 9.0 percent by volume; and

(4) If a combustion device is used to produce the inert gas, have a hydraulic seal and non-return valve between the combustion device and the vapor collection line.

(i) An enriching system must:

(1) Supply sufficient compatible hydrocarbon vapor to the vapor stream to ensure that the hydrocarbon concentration throughout the vapor collection system is maintained above 170 percent by volume of the upper flammable limit;

(2) Activate an alarm when the hydrocarbon concentration in the vapor collection line falls below 170 percent by volume of the upper flammable limit; and

(3) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the hydrocarbon concentration in the vapor collection line falls below 150 percent by volume of the upper flammable limit.

(j) Oxygen analyzers may be used in lieu of hydrocarbon analyzers in an enriching system at a facility that receives cargo vapor only from a vessel with non-inerted cargo tanks, provided that the analyzers:

(1) Activate an alarm when the oxygen concentration in the vapor collection line exceeds 15.5 percent by volume; and

(2) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the oxygen concentration in the vapor collection line exceeds 16.5 percent by volume.

(k) An enriching system may be used in a vapor collection system that receives cargo vapor from a vessel with inerted cargo tanks if:

(1) Hydrocarbon analyzers are used to comply with paragraph (i)(2) and (i)(3) of this section; or

(2) If oxygen analyzers are used, the analyzers activate an alarm when the oxygen concentration in the vapor collection line exceeds 8 percent by volume, and close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the oxygen concentration exceeds 9 percent by volume.

(l) An air dilution system must:

(1) Supply sufficient additional air to the vapor stream to ensure that the hydrocarbon concentration throughout the vapor collection system is maintained below 30 percent by volume of the lower flammable limit;

(2) Activate an alarm when the hydrocarbon concentration in the vapor collection line exceeds 30 percent by volume of the lower flammable limit; and

(3) Close the remotely operated cargo vapor shutoff valve required by § 154.810(a) of this subpart when the hydrocarbon concentration in the vapor collection line exceeds 50 percent by volume of the lower flammable limit.

[CGD 88–102, 55 FR 25429, June 21, 1990; 55 FR 39270, Sept. 26, 1990, as amended by USCG–2001–8661, 74 FR 45023, Aug. 31, 2009]

§ 154.826 Vapor compressors and blowers.

(a) Each inlet and outlet to a compressor or blower which handles vapor that has not been inerted, enriched, or

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diluted in accordance with §154.824 of this subpart must be fitted with:

- (1) A detonation arrester;
- (2) A flame arrester; or
- (3) An explosion suppression system acceptable to the Commandant (CG-522).

(b) If a reciprocating or screw-type compressor handles vapor in the vapor collection system, it must be provided with indicators and audible and visible alarms to warn against the following conditions:

- (1) Excessive discharge gas temperature at each compressor chamber or cylinder;
- (2) Excessive cooling water temperature;
- (3) Excessive vibration;
- (4) Low lube oil level;
- (5) Low lube oil pressure; and
- (6) Excessive shaft bearing temperatures.

(c) If a liquid ring-type compressor handles vapor in the vapor collection system, it must be provided with indicators and audible and visible alarms to warn against the following conditions:

- (1) Low level of liquid sealing medium;
- (2) Lack of flow of liquid sealing medium;
- (3) Excessive temperature of the liquid sealing medium;
- (4) Low lube oil level;
- (5) Low lube oil pressure, if pressurized lubricating system; and
- (6) Excessive shaft bearing temperature.

(d) If a centrifugal compressor, fan, or lobe blower handles vapor in the vapor collection system, construction of the blades and/or housing must meet one of the following:

- (1) Blades or housing of nonmetallic construction;
- (2) Blades and housing of nonferrous material;
- (3) Blades and housing of corrosion resistant steel;
- (4) Ferrous blades and housing with one-half inch or more design tip clearance; or
- (5) Blades of aluminum or magnesium alloy and a ferrous housing with

a nonferrous insert sleeve at the periphery of the impeller.

[CGD 88-102, 55 FR 25429, June 21, 1990, as amended by CGD 96-026, 61 FR 33666, June 28, 1996; USCG-2010-0351, 75 FR 36284, June 25, 2010]

§ 154.828 Vapor recovery and vapor destruction units.

(a) The inlet to a vapor recovery unit which receives cargo vapor that has not been inerted, enriched, or diluted in accordance with §154.824 of this subpart must be fitted with one of the following:

- (1) A detonation arrester;
- (2) A flame arrester; or
- (3) An explosion suppression system acceptable to the Commandant (CG-522).

(b) The inlet to a vapor destruction unit must:

- (1) Have a liquid seal; and
- (2) Have two quick-closing stop valves installed in the vapor line.

(c) A vapor destruction unit must:

- (1) Not be within 30 meters (98.8 ft.) of any tank vessel berth or mooring at the facility;
- (2) Have a flame arrester or detonation arrester fitted in the vapor line; and
- (3) Alarm and shut down when a flame is detected on the flame arrester or detonation arrester.

(d) When a vapor destruction unit shuts down or has a flame-out condition the vapor destruction unit control system must:

- (1) Close the quick-closing stop valves required by paragraph (b)(2) of this section; and
- (2) Close the remotely operated cargo vapor shutoff valve required by §154.810(a) of this subpart.

[CGD 88-102, 55 FR 25429, June 21, 1990, as amended by CGD 96-026, 61 FR 33666, June 28, 1996; USCG-2010-0351, 75 FR 36284, June 25, 2010]

§ 154.840 Personnel training.

(a) A person in charge of a transfer operation utilizing a vapor control system must have completed a training program covering the particular system installed at the facility. Training must include drills or demonstrations